

REMARKS

Claims 1-16 are pending in this application. During a telephone call with Examiner Bowers on August 14, 2003, restriction for examination purposes was indicated for inventions of Group I, namely claims 1-16, drawn to methods for making altPSMs, and Group II, namely claims 17-20, drawn to an altPSM, and a provisional election was made to prosecute the inventions of Group I, claims 1-16. Applicants affirm election to prosecute the inventions of Group I, claims 1-16, without traverse, in response to the restriction requirement. Accordingly, Applicants have canceled claims 17-20, without prejudice or disclaimer of subject matter, reserving the right to prosecute the claims directed to the non-elected invention in a divisional application.

Claims 2-5 and 10-13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Accordingly, to place claims 2-5 and 10-13 in condition for allowance, Applicants have rewritten claims 2 and 10 in independent form, and claims 3-5 and 11-13 are now dependent on claims 2 and 10 as amended. Applicants respectfully request that the objections be reconsidered and withdrawn.

Claims 1, 6-9 and 14-16 stand rejected on prior art grounds.

Reconsideration of the Examiner's prior art rejections is respectfully requested based on the following discussion.

I. The 35 U.S.C. §112, second paragraph rejections

Claims 8 and 16 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. More particularly, the Office Action states that the term

“about 0.8-1.2” in claims 8 and 16 is indefinite.

Accordingly, Applicants have amended claims 8 and 16 to clarify the requirement that the width be in the range 0.8-1.2 x LW.

Applicants submit that claims 8 and 16, as amended, clearly point out and distinctly claims the subject matter which Applicants regard as the invention and satisfy the requirements of 35 U.S.C. §112, second paragraph. Therefore, Applicants respectfully request that these rejections be reconsidered and withdrawn.

II. The 35 U.S.C. §102 Rejection based on Winder et al.

Claims 1, 6, 9 and 14 stand rejected under 35 U.S.C. §102 as being anticipated by Winder et al. (US 6,416,907).

Claim 1 is directed to a method for designing an alternating phase shifting mask (altPSM) for projecting an image on an image plane, comprising: providing a circuit layout; identifying a critical element of said circuit layout, said critical element having a layout dimension (LW), said layout dimension corresponding to a target image dimension in the image plane; providing a relationship between phase shape width and said target image dimension; selecting an optimal phase shape width so that said relationship has an optimal value; and generating a phase shape disposed adjacent to said layout dimension wherein said phase shape has said optimal phase shape width. Independent claim 9 is directed to a computer program product having instructions for performing the method of the invention as recited in claim 1.

A salient feature of the present invention is that a relationship between the width of the phase shape and the width of the image of the shape to be printed is provided. The optimal width of a phase shape is chosen and generated for use in the mask layout so that an optimal value of the relationship between the phase shape width and target image dimension is obtained.

As understood, Winder et al. disclose a method of creating a phase shift mask whereby

phase shapes are provided adjacent a shape to be printed so that the shape to be printed will print (Abstract). The spaces between shapes to be printed are analyzed to determine whether a phase shift shape should be assigned to that space. This is performed by examining whether a space between shapes to be printed is within a “threshold dimension plus the border width” (col. 12, lines 2-4). The distance used for comparison is termed a “stretched-phase” shape (col. 12, lines 10-11). The outside edge of a shape to be printed is expanded by a “temporary shape width” (col. 10, lines 38-41). Note that the “threshold dimension,” the “border width” and the “temporary shape width” are fixed dimensions input by the user (col. 7, lines 59-65). Although Winder et al. uses the terminology “stretched-phase” shape to compare the spacing distances, the dimensions used to create “stretched” shapes are based on fixed dimensions input by the user, and are merely used to determine if the distance between shapes to be printed is within a predetermined distance and merely to determine whether or not a phase shape should be generated on the mask. However, the “stretched-phase” shapes of Winder et al. are not actually generated on the mask, unless the phase shape is at the end of a dense array of lines, in which case the width is fixed at four times the fixed threshold dimension (see, for example, col. 13, lines 49-56 and FIG. 12). There is no teaching or suggestion by Winder et al. that the width of the phase shape may be varied based on the image width. More particularly, Winder et al. fails to teach or suggest generating an optimal phase shape width that will result in obtaining an optimal value of a relationship between the phase width and the image width. By contrast, the present invention contemplates that the final phase widths generated on the mask may vary depending on the relationship used for optimization (for example, see page 14, line 22 continuing to line 1, page 15).

Applicants submit that Winder et al. fails to disclose all the essential elements of the present invention as recited in claims 1 and 9 and therefore independent claims 1 and 9 are patentably distinct from Winder et al., and claims 6 and 14, by virtue of their dependence on claims 1 and 9, respectively, are similarly patentable. Thus, Applicants respectfully request that

these rejections be reconsidered and withdrawn.

III. The 35 U.S.C. §103(a) Rejection based on Winder et al. in view of Samuels et al.

Claims 7 and 15 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Winder et al. (US 6,416,907) in view of Samuels et al. (US 5,862,058).

As discussed above, Winder et al. fails to teach or suggest all the essential elements of claims 1 and 9. More specifically, among other things, Winder et al. fails to teach or suggest selecting an optimal phase shape width so that a relationship between the phase width and the target image dimension has an optimal value and generating a phase shape width disposed adjacent to a layout dimension wherein the phase shape has the optimal phase shape width.

As understood, Samuels et al. discloses an optical proximity correction method and system for determining a modified line width. However, Samuels et al. fails to teach or suggest the method steps according to the present invention, and particularly fails to teach or suggest selecting an optimal phase shape width so that a relationship between the phase width and the target image dimension has an optimal value and generating a phase shape width disposed adjacent to a layout dimension wherein the phase shape has the optimal phase shape width. Therefore, one of ordinary skill would not be motivated to combine the teachings of Samuels et al. with Winder et al. to arrive at the present invention.

In view of the discussion above, Applicants submit that neither Winder et al. alone nor in combination with Samuels et al. teaches or suggests all the elements of claims 1 and 9. Applicants submit that claims 1 and 9 are patentable over Winder et al. individually and in combination with Samuels et al., and therefore claims 7 and 15 are similarly patentable by virtue of their dependence on claims 1 and 9, respectively. Thus, Applicants respectfully request that the rejections be reconsidered and withdrawn.

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CONCLUSION

In view of the foregoing, Applicants submit that claims 1-16, all the claims currently being examined in the application, are patentably distinct from the prior art of record and are in condition for allowance. Should the Examiner find the application to be other than in condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below to discuss any other changes deemed necessary. The Commissioner is authorized to charge any additional fees due or credit overpayments to Deposit Account No. 09-0458.

Applicants' undersigned agent may be reached by telephone at (845) 894-6919. All correspondence should continue to be directed to the address listed below.

Respectfully submitted,

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